

AMENDMENTS TO THE CLAIMS

1. (currently amended) A method of ~~synthesising~~ synthesizing electrocardiographic (ECG) signals comprising receiving signals from a first group of electrodes connected to predetermined locations on a human body to acquire a first set of ECG signals and deriving at least one further ECG signal using predetermined transformation(s) on said first set of ECG signals or a subset thereof to form a desired set of signals, wherein the first group of electrodes comprises the standard 12 lead electrode sites V2 and V5 plus at least one electrode positioned substantially level with V5 on the right anterior axillary ~~auxiliary~~ line, and at least one further electrode positioned on each of the right hand side and left hand side of the body and wherein said ECG signals are synthesized from data obtained from less than ten electrode sites.

2. (currently amended) A method as claimed in claim 1 wherein the electrode sites are located at:

V2: the standard 12 lead electrode site V2;

V5: the standard 12 lead electrode site V5;

V5R: level with V5 on the right anterior axillary ~~auxiliary~~ line;

RA: the standard 12 lead electrode site RA (arm, shoulder, wrist or hand); and

LA: the standard 12 lead electrode site LA (arm, shoulder, wrist or hand).

3. (original) The method of claim 1, wherein said further electrodes on the right hand side and left hand side of the body are placed on the torso substantially level with the upper portion of the limbs.

4. (currently amended) A method as claimed in claim 1 wherein the electrode sites are located at:

V2: the standard 12 lead electrode site V2;

V5: the standard 12 lead electrode site V5;

V5R: level with V5 on the right anterior axillary ~~auxiliary~~ line;

R: anywhere in the region of the right hand side of the body, between the front upper chest above the level of the heart and the right arm, shoulder or hand; and

L: anywhere in the region of the left hand side of the body, between the front upper chest above the level of the heart and the left arm, shoulder or hand.

5. (currently amended) A method as claimed in claim 3 wherein the electrode sites are located at:

V2: the standard 12 lead electrode site V2;

V5: the standard 12 lead electrode site V5;

V5R: level with V5 on the right anterior ~~axillary~~ ~~auxiliary~~ line;

RC: on the upper chest of the body, at the same height as the manubrium and on the right mid-clavicle line; and

LC: on the upper chest of the body, at the same height as the manubrium and on the left mid-clavicle line.

6. (previously presented) A method for obtaining a set of ECG signals as claimed in claim 1 wherein the electrode position V2 is replaced by an electrode position Vc which is defined to be on the sternum directly between the standard electrode sites V1 and V2.

7. (currently amended) A method of synthesizing electrocardiographic (ECG) signals comprising receiving signals from a first group of electrodes connected to predetermined locations on a human body to acquire a first set of ECG signals and deriving at least one further ECG signal using predetermined transformation(s) on said first set of ECG signals or a subset thereof to form a desired set of signals, wherein the first group of electrodes comprises the standard 12 lead electrode sites V2 and V5 plus at least one electrode positioned substantially level with V5 on the right anterior axillary line, and at least one further electrode positioned on each of the right hand side and left hand side of the body
~~The method as claimed in claim 1,~~ further comprising deriving an ECG signal from a temporary electrode that is not connected for the full duration the ECG measurement.

8. (currently amended) The method as claimed in claim 7, further comprising generating

a subject-specific transformation or set of transformations acting on the ECG signals to ~~synthesise~~ synthesize a representation of the temporary electrode signal after disconnection of the temporary electrode.

9. (previously presented) The method of claim 7 wherein the temporary electrode is reactivated or reapplied at a later time in order to redefine the subject-specific transformations.

10. (previously presented) The method of claim 7, further comprising defining a reference potential for each temporary electrode from one of the following options: the electrical potential of an ECG electrode; the electrical potential of a different temporary electrode or a potential formed by a combination of ECG electrode(s) and/or temporary electrode(s).

11. (previously presented) The method of claim 7 wherein a temporary ECG signal is defined as the potential difference between the potential at the temporary electrode and its reference potential.

12. (previously presented) The method as claimed in claim 7 further comprising obtaining a set of ECG signals from both the first set of ECG signals and the temporary electrode signal.

13. (currently amended) A method as claimed in claim 12 wherein the temporary signal(s) is ~~synthesised~~ synthesized using subject-specific transformations on the second set of ECG signals.

14. (previously presented) The method as claimed in claim 7 further comprising obtaining a second set of ECG signals from the subject using just the first group of electrodes.

15. (currently amended) A method as claimed in claim 7 wherein further ECG signals are

derived using a predetermined transformation or set of transformations on the set comprised from, or a subset selected from, the second set of ECG signals and at least one ~~synthesised~~ synthesized temporary electrode signal.

16. (previously presented) A method as claimed in claim 7 wherein at least one temporary electrode is located at any point on the right arm, shoulder or hand.

17. (previously presented) A method as claimed in claim 7 wherein at least one temporary electrode is located at any point on the left arm, shoulder or hand.

18. (previously presented) A method as claimed in claim 7 wherein the temporary electrode(s) are connected at a different time from when the first set of ECG signals is acquired, or equivalently, activated temporarily, and the subject-specific transformations retrospectively calculated.

19. (previously presented) A method as claimed in claim 7 wherein a temporary electrode, after initial use, is used to perform functions other than that of supplying electrocardiogram signal data.

20. (previously presented) The method of claim 7 wherein an input connection to a measurement means or device used to obtain a signal from an ECG electrode(s) has a secondary use to obtain a signal from a temporary electrode.

21. (previously presented) The method of claim 1 wherein the method further comprises switching an electrode between separate modes of operation wherein in a first mode, the electrode measures an ECG signal and in a second mode, the electrode forms a reference electrical connection between a subject and an ECG measurement means.

22. (previously presented) The method of claim 1 further comprising:

applying a plurality of electrodes on a subject's body to enable the measurement of a set of ECG signals for that subject;

detecting subject's body posture; and
selecting or modifying the set of transformations on the basis of the subject's body posture.

23. (currently amended) The method of claim 1 wherein a posture of said ~~the~~ body ~~posture~~ is detected by an accelerometer, tilt sensor or manual switch.

24. (currently amended) The method of claim 1, further comprising the steps of:
calculating a simulation matrix for at least one temporary signal from the first set of data or a subset thereof;
applying a simulation matrix to the second set of ECG signals to generate a simulated temporary signal; ~~and~~
applying a fixed derivation matrix to the second data set plus the simulated signal to define an unmeasured ECG lead; and
adapting one or both of said matrices to compensate for subject specific variations in posture and movement.

25. (original) The method of claim 24 wherein the method of deriving unmeasured ECG signals comprises forming a matrix R which contains data points from the measured ECG signals, calculating a solution matrix A from the temporary electrode signals, and calculating a matrix sX using $sX(i)=R*A(i)$.

26. (original) The method of claim 25 wherein a matrix M is formed from the first set of ECG signals plus the simulated temporary electrode signals, and further comprising forming a derived matrix $dL(x)=M*B(x)$, where B(x) is a predetermined solution matrix and dL(x) simulates the data that would have been observed at an unmeasured electrode site.

27. (previously presented) The method as claimed in claim 1 wherein the method further comprises measuring a first set of ECG signals, processing said signals to derive a standard 12 lead ECG and displaying said standard 12 lead ECG in real time.

28. (previously presented) The method as claimed in claim 1 wherein the first set of ECG signals is recorded and stored for later processing to derive a standard 12 lead ECG.

29. (original) The method claimed in claim 28 further comprising displaying the derived standard 12 lead ECG signal.

30. (currently amended) A method for obtaining a set of electrocardiographic (ECG) signals of the general type comprising ~~synthesising~~ synthesizing ECG signals by receiving signals from a first group of electrodes connected to predetermined locations on a human body to acquire a first set of ECG signals and deriving at least one further ECG signal using predetermined transformation(s) on said first set of ECG signals or a subset thereof to form a desired set of signals, wherein said first group includes at least electrodes located at the following sites:

R and L: placed on or near the right and left upper limbs respectively; and

Vc: placed on the sternum.

31. (original) A method as claimed in claim 30 wherein sites R and L comprise specifically sites RC and LC placed at the same level as the manubrium on the right and left mid-clavicular lines respectively.

32. (original) A method as claimed in claim 30 wherein sites R and L comprise sites RA and LA placed on the right arm and left arm respectively.

33. (previously presented) A method as claimed in claim 30 wherein site Vc is located on the sternum directly between the standard electrode sites V1 and V2.

34. (currently amended) A method for obtaining a set of ECG signals of the general type comprising ~~synthesising~~ synthesizing electrocardiographic (ECG) signals by receiving signals from a first group of electrodes connected to predetermined locations on a human body to acquire a first set of ECG signals and deriving at least one further ECG signal

using predetermined transformation(s) on said first set of ECG signals or a subset thereof to form a desired set of signals, wherein said first group includes at least electrodes located at the following sites:

V_m: one of the standard 12 lead electrode sites V₄, V₅ and V₆ (m=4, 5 or 6);

V_{nR}: level with one of the standard electrode sites V₄, V₅ and V₆ (n=4, 5 or 6) on the right midclavicular line, right anterior ~~axillary~~ ~~auxiliary~~ line or right midaxillary ~~midaxillary~~ line respectively; and

V_c: placed on the sternum.

35. (original) A method as claimed in claim 34 wherein m=n, so that V_{nR} is opposite V_m and is therefore easier to place.

36. (original) A method as claimed in claim 35 wherein in a preferred embodiment, m=n=5, so that the sites V_m and V_{nR} are V₅ and V_{5R} respectively.

37. (previously presented) A method as claimed in claim 34 wherein V_c is located directly between the standard electrode sites V₁ and V₂.

38. (currently amended) A method as claimed in claim 30 wherein at least five electrode sites are chosen, wherein said five electrode sites comprise said V_m site, said V_{nR} site, said V_c site, a R site placed on or near the right upper limb and a L site placed on or near the left upper limb.

39. (previously presented) The method as claimed in claim 30 wherein the method further comprises deriving an ECG signal from a temporary electrode that is not connected for the full duration the ECG measurement.

40. (currently amended) A method for obtaining a set of electrocardiographic (ECG) signals by:

receiving signals from a first group of electrodes connected to predetermined locations on a human body to acquire a first set of ECG signals;

~~synthesising~~ synthesizing at least one further ECG signal using predetermined transformation(s) on said first set of ECG signals or a subset thereof to form a ~~synthesised~~ synthesized set of ECG signals, each ~~synthesised~~ synthesized signal corresponding to a location on the body (hereinafter referred to as the ~~synthesised~~ synthesized location);

detecting the body's posture; and

selecting or modifying the transformations used in said ~~synthesising~~ synthesizing step on the basis of the detected body posture, so as to reduce posture-induced inaccuracies between each ~~synthesised~~ synthesized signal and a real signal that would be measured at the ~~synthesised~~ synthesized location in a given posture.

41. (original) The method of claim 40 wherein the body posture is detected using an accelerometer, tilt sensor or manual switch.

42. (currently amended) An apparatus for ~~synthesising~~ synthesizing ECG data comprising means arranged to receive measured ECG signals and signal processing means arranged to perform the method steps according to claim 1.

43. (currently amended) The apparatus as claimed in claim 42 wherein said signal processing means 15 arranged to implement a linear combination processing array for processing said digitized ~~digitised~~ signals to derive a standard 12 lead ECG.

44. (previously presented) An apparatus as claimed in claim 42 wherein said signal processing means is implemented using a general purpose microprocessor or digital signal processor circuit under software control.

45. (previously presented) The apparatus as claimed in claim 42, wherein the apparatus comprises separate units for processing and displaying ECG signals respectively; and means for interfacing the separate units for processing and displaying the ECG signals.

46. (currently amended) A system for measuring ECG signals comprising a ~~synthesising~~

synthesizing apparatus as claimed in claim 42 in combination with means for storing signals from a subset of the group of electrodes, said ~~synthesising~~ synthesizing apparatus being operable to process the stored signals from said subset of electrodes to obtain a standard 12 lead ECG.

47. (original) The system as claimed in claim 46 further comprising a set of leads corresponding specifically to said subset of electrodes for obtaining said signals for storage and processing.

48. (previously presented) The system as claimed in claim 46 wherein the means for storing said signal data comprises a removable storage medium.

49. (previously presented) A storage device carrying program instructions for causing a general purpose microprocessor or digital signal processor circuit to implement a method as claimed in claims 1.

50. (currently amended) An apparatus for ~~synthesising~~ synthesizing ECG data comprising means arranged to receive measured ECG signals and signal processing means arranged to perform the method steps according to claim 30.

51. (previously presented) A storage device carrying program instructions for causing a general purpose microprocessor or digital signal processor circuit to implement a method as claimed in claim 30.

52. (currently amended) An apparatus for ~~synthesising~~ synthesizing ECG data comprising means arranged to receive measured ECG signals and signal processing means arranged to perform the method steps according to claim 34.

53. (previously presented) A storage device carrying program instructions for causing a general purpose microprocessor or digital signal processor circuit to implement a method as claimed in claim 34.

54. (currently amended) An apparatus for ~~synthesising~~ synthesizing ECG data comprising means arranged to receive measured ECG signals and signal processing means arranged to perform the method steps according to claim 40.

55. (previously presented) A storage device carrying program instructions for causing a general purpose microprocessor or digital signal processor circuit to implement a method as claimed in claim 40.

Respectfully submitted,



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